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BRITISH HONDURAS ANNUAL MEDICAL REPORT FOR THE YEAR ENDING 31st DECEMBER, 1954.

I. MAIN EVENTS.

STAFF.

The authorised Medical Staff consists of a Director of Medical Services, a Medical Officer of Health, a Surgeon Specialist and eight Medical Officers.

Dr. G. G. Smith returned from vacation leave on 7th September.

Dr. P. J. Van den Brul arrived on first posting to the country on 25th May.

Dr. G. E. Walters arrived on first posting to the country on 25th October.

Miss J. E. Fryer, Assistant Matron, arrived on 12th June.

Dr. S. H. Wharton returned from vacation leave on 10th October.

Mr. B. Markowski, Surgeon Specialist, left for vacation leave on 13th July

VISITS.

Dr. A. M. Wilson Rae accompanied by Dr. J. W. P. Harkness visited the country from 23rd to 30th November.

Dr. S. F. Farnsworth, Representative Zone III, Pan American Sanitary Bureau, visited the country in March accompanied by Dr. J. Ousset.

Mr. Norman Craig, Adviser in Health Education to Pan American Sanitary Bureau (World Health Organization) Zone III visited the country on 12th October.

Mr. E. H. Magoon of the Rockefeller Foundation visited the country in December.

Mr. E. Henriksen, Statistician UNICEF visited the country in November.

TRAINING.

Dr. G. G. Smith obtained the qualification D. T. M. & H. (Eng.) in July 1954.

Ten candidates for general nursing training and one for rural health nursing were accepted during the year.

Three student nurses qualified, and three rural health nurses completed their training.

LEGISLATION.

Statutory Instrument No. 11—Mosquito (Protection) Regulations, 1954.

FINANCE.

The estimated expenditure of the department was $419,280.00 representing 8.63 of the Colony's budget.

A. REVENUE—

Laboratory Fees	$910.00
Hospital (Maintenance of Patients and Operation Fees)	13,843.90
Total	$14,753.90

B. EXPENDITURE—

(i) Personal Emoluments	$179,987.29
(ii) Dieting (*a*) Nurses	22,315.52
(*b*) Patients	61,950.08

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Incurred in respect of the following institutions:—

Institutions	Total Expenditure in Dollars	Average Daily No. of Patients	Cost per head per diem in ¢
Belize Hospital	24,956.34	111.13	.62
Mental Hospital, Poor House and T.B. Sanitorium	27,021.41	166.35	.45
Corozal Hospital	2,250.91	18.14	.34
Orange Walk Hospital	1,305.97	7.93	.45
Stann Creek Hospital	2,359.87	13.3	.49
Toledo Hospital	1,996.78	15.5	.35
Cayo Hospital	2,058.80	10.22	.55

(iii) Feeding of School Children

	Belize	$14,086.48
	Districts	3,390.71
		$17,477.19

(iv) Health Services

	Belize	$15,721.77
	Districts	4,612.95
		$20,334.72

(v) Other Charges $121,011.25

II. DEVELOPMENT AND WELFARE SCHEMES—PART II.

(*a*) PLANNED OR INCOMPLETE.

1. *Belize Hospital*: The first stage of the re-building programme was completed on 31st October when the operating theatre and one ward upstairs together with the maternity ward and one ward downstairs were handed over. The maternity department has, however, had to remain in its temporary accommodation, as both new wards are needed for surgical cases.

The second stage should be complete during the first half of 1955, and with this the new hospital will be able to function fully. The new accommodation provided is very suitable, giving tiled floors, eight-bedded wards, air conditioned operating theatres and a modern maternity section with improved ventilation.

The third stage provides for the repairing and repainting of the old hospital to which the new wing is attached.

The final bed state will be:—

MALE	Surgical	22	
	Medical	26	48
FEMALE	Surgical	32	
	Medical	26	58
CHILDREN		18	18
MATERNITY	General	16	
	Private	4	
TOTAL	General Beds		106
	Maternity Beds		16
	Maternity Beds (Private)		4
	Children		18

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2. *Stann Creek Hospital*: It is hoped to start with the re-building of this hospital in 1955. The re-built hospital will have one completely new wing giving modern accommodation for 24 patients. Other parts of the old hospital will be rebuilt to give a better out-patient department and kitchen accommodation together with improved maternity and surgical facilities, and provision for X-ray equipment. The Health Department is to be re-built and is to be adjoined by accommodation for an infant welfare clinic.

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3. *Health Centre—Belize*: It is hoped to make a start with this building in 1955. A site has been given by Belize City Council in the southern part of the town.

Plans for this building and for the Stann Creek Hospital were seen by Dr. Wilson Rae and Dr. Harkness during their visit in November. Approval was given for the health centre to be constructed, and for the Stann Creek Hospit alafter alternations to the surgical maternity and X-ray accommodation and additions to the Health Department and a new Infant Welfare Clinic have been provided.

(*b*) PROPOSED—DEVELOPMENT PLAN 1955-60

This includes the following:

1. Re-building of two district hospitals *i.e.* at Orange Walk and Cayo.
2. The provision of a rehabilitation centre for convalescent tuberculous cases.
3. Provision of x-ray equipment for district hospitals.
4. Three new rural health centres *i.e.* at Caye Caulker, Seine Bight and Crique Sarco (or Oxtasha).
5. The continuation of training at West Indies Training Centre for sanitary inspectors and public health visitors.

Mobile Health Centres: These would be contained in vans and would travel through parts at present unserved by hospitals or rural health centres. The idea is to provide a regular visiting service by public health nurses from main district towns or by nurses from the rural health centres. The primary object of these would of course be infant welfare and maternity service to the communities. Trials carried out have proved very successful.

Owing to prospective financial stringency in 1955, however, and the cost of maintaining two centres, it is at present by no means certain that we shall have them in 1955. Owing however to their obvious value in completing the public health set-up in this colony of scattered small hamlets, we shall persist in pressing for them.

Water Supply and Sewage—Belize: Included in the plan is provision for improved water supplies and water-carried sewage for Belize, which will be dealt with later on in the report.

III. HOUSING

In 1954 there were 3,875 houses in Belize and 8,287 houses in the rest of the colony. The total of 12,162 houses for an estimated population of 78,094 gives an average of more than six persons living in a house. The average floor area of a house in British Honduras is 200 square feet therefore over-crowding is a serious problem.

A recent survey through questionnaires revealed that in Belize alone 1,034 families are looking for better accommodation. 708 families could pay monthly rents up to $12.00 and 292 families are looking for houses with monthly rental of over $12.00. 135 families among the interviewed could contribute towards the cost of building new houses and 74 families in need of new buildings owned lots on which to build.

Private individuals in Belize have put up 112 new houses during the year and through enclosures and additions another 120 new flats became available. A great number of these houses, however, are only replacing buildings which had to be pulled down on the same site and they do not appreciably alter the situation of overcrowding.

Government has built 50 new houses during the year and these are sold on a hire-purchase system. Plans have been made to develop a new housing estate for over 500 houses, and to encourage aided self help and other community undertaking to reduce the housing shortage.

IV. PUBLIC HEALTH

The general health of the population remained good throughout the year. The death rate showed an increase from 10.77 in 1953 to 11.22 per 1,000 of population in 1954. The infant mortality rate increased again from 87.07 in 1953 to 93.47 per 1,000 live births in 1954. This increase means 42 more deaths (302 as against 260) and 245 more births (3,281 as against 2,986) than in 1953. Analysis of the causes of these deaths shows the most striking increase in the group "Diarrhoea and Enteritis" *i.e.* from 25 in 1953 to 54 in 1954. Comment upon this factor is made later in this report.

Vital statistics are shown below *i.e.*

	1953	1954
Estimated population at 31st December	75,782	78,094
Number of registered births	2,986	3,231
Number of deaths from all causes	816	876
Number of deaths in infants under 1 year	260	302
Number of deaths in infants under 1 month	113	121
Number of still births	105	82
Rates—		
Birth rate per 1,000 of population	39.4	41.4
Crude death rate per 1,000 of population	10.77	11.22
Infant mortality rate per 1,000 live births	87.07	93.47
Neonatal death rate per 1,000 live births	37.84	37.45
Still birth rate per 100 live births	3.52	2.54

55.14% of deaths were certified by a medical practitioner, as compared with 55.51% in 1953.

COMMUNICABLE DISEASES

Malaria: The reduction in hospital admissions from this cause has continued in 1954. This figure was 460 in 1952, and 341 in 1953. For 1954 the figure is 311. This reduction has been attributed to the country-wide bi-annual spraying with D.D.T. emulsion. Except in Stann Creek town where a scheme devised by E. H. Magoon for its drainage has been partially carried out, no other anti-malaria measure besides D.D.T. spraying has been attempted; so the reduction in the malaria incidence remains to its credit. We have as yet no evidence of D.D.T. resistant strains of anopheline mosquitoes, but in view of the fact that they have been subjected to seven successive spraying with D.D.T., the development of this resistance is likely. For this reason, and also because only a single annual spraying is required, we will change to Dieldrin in 1955 for our residual spray campaign. The results of this change are awaited with much interest.

In the course of our vector survey in 1953, it was discovered that two important vectors *i.e.* Anopheles Darlingi and Anopheles Vestitipenis had been eliminated. This is a very gratifying result of our spray programme, and in view of the fact that both are house-haunting species, may safely be attributed to this programme. The same vector survey indicated however that Anopheles Albimanus is still present and is in fact more widespread than during the previous survey in 1940. This species is of course exephilic and therefore not so vulnerable to residual spray technique as the others. A further vector survey has been undertaken (October 1954) the results of which are not yet to hand, but at this stage it would appear that we are approaching the time when further progress in the reduction in the incidence of malaria will depend not on continuation of the spray programme but on drainage of the more highly populated areas such as Belize, Stann Creek and Punta Gorda to remove the breeding places of Anopheles Albimanus. Until these measures are carried out, we are in constant danger of an epidemic of malaria due to a sudden increase in the numbers of Anopheles Albimanus which has so far resisted our efforts to eliminate it with residual spraying. Plans for the drainage of Stann Creek and Punta Gorda have been drawn up by Mr. E. H. Magoon of the Rockefeller Foundation, and his advice has also been sought on the problem of draining the Belize peninsula.

In order to improve the diagnosis of malaria, new miscroscopes are being ordered for district hospitals in 1955. When these are received insistence will be made on the blood-slide diagnosis of malaria.

Malaria

Hospital	Cases	Total Admission	Admission Percentage
Belize	48	2,809	1.7
Corozal	23	331	6.95
El Cayo	49	518	9.46
Stann Creek	97	760	12.76
Toledo	78	528	14.77
Orange Walk	16	215	7.44
	311	5,161	6.03

Tuberculosis: The incidence of this disease continues much as before. All available accommodation for the treatment of this disease is taken up, and more (20 beds) is being opened early in 1955. The beds available will then number 46 with 9 huts giving a total accomodation for 55. There are signs that for Belize this accommodation should soon prove sufficient *i.e.* we will soon be able to accommodate all the known clinical cases which need hospital treatment. Of the districts, Stann Creek has a large number of cases awaiting admission (15).

	Admissions	*Deaths*	*Death per* 100,000
1952	85	35	48
1953	61	20	26
1954	86	34	44

Nicotinic Acid Hydrazide combined with Streptomycin continues to give good results in treated cases. The majority of deaths now occurring are in cases which are (*a*) from very remote parts or (*b*) too far advanced when first discovered to be susceptible to treatment.

Poor housing conditions in Belize are still a main contributing factor, and the present incidence may be expected to continue until improvement in the housing situation can be achieved.

The B.C.G. Campaign is the subject of a separate report by the Medical Officer of Health, which is attached to this report.

Yellow Fever: During 1954 this disease spread to Spanish Honduras though with a very small incidence in a remote part of the country. The latest report received is of two cases in San Pedro Sula in October. This town is on the main air-route between Belize and the capital of Honduras, Tegucigalpa.

Inoculation of the population against Yellow Fever was continued throughout 1954 (i) by the B.C.G. vaccination team (ii) by inoculation of infants at Infant Welfare Clinics (iii) in Belize a mass campaign in January, with a "follow-up" in October following the report of the San Pedro Sula cases. By these means, it is estimated that roughly 75% of the population is now protected. The D.D.T. residual spray campaign has apparently been effective in eliminating the vector, Aedes Aegypti, both in Belize and in Corozal.

The effect of the simultaneous vaccination with B.C.G. on the immunity produced by inoculation with yellow fever vaccine has been a subject of interest to the Instituto Carlos Finlay of Bogota, Columbia from which institute our supplies of yellow fever vaccine are obtained, and blood samples from subjects of this colony who received the two together are at present under test in the laboratories at Bogota.

The campaign to ensure that vats and water containers in Belize are not left uncovered or unscreened has been continued throughout the year, and D.D.T. has been used to ensure destruction of larvae.

A note on the effect of B.C.G. on the immunity produced by Yellow Fever vaccine is included in the Medical Officer of Health's report.

Gastro-Enteritis: The death rates in children from this disease in 1953 and 1954 are shown below:—

	Under 1 *year*	1—5 *years*
1953	25	9
1944	54	28

The increase in 1954 is therefore over 100% in the cases of infants under one year and over 200% in the case of older children. This is an alarming increase which has taken place in spite of the strengthening of all preventive measures in the colony, and indicate a factor beyond our control. In Belize this factor is of course the continued use of the canals as open sewers which form an irresistible attraction for flies. The handing over by government to Belize City Council of the scavenging and street cleaning from 1st January, 1953 may also be a factor. In both sections *i.e.* infants under one year and children from 1—5 years, this disease is now the leading cause of death. The estimated increase of the population of British Honduras in 1954 was 2,312, but this number could have been increased by 82 had not deaths from gastro-enteritis alone in children under five removed this number. The lesson in Belize is plain. With its slowly increasing population, a proper sewage system and an adequate method of collection and disposal of rubbish must be devised lest the infant mortality rate continue its climb towards parity with the birth rate.

Venereal Diseases: There were 2,453 attendances at the Venereal Disease Clinic of which 1,937 were for syphilis and 516 for gonorrhoea. 162 new cases of syphilis and 212 new cases of gonorrhoea were notified.

V. PREVENTIVE MEASURES

During 1954 the Development Plan Part III was formulated and it includes provision for improved water supplies and a sewage system for Belize. Both these measures are long overdue.

Of the two problems the installation of an improved water supply is much the simpler to solve in view of the apparently inexhaustible water field which exists at the airport nine miles from Belize. It is therefore a matter of sinking more wells and laying more pipes.

The installation of a sewage system in Belize is fraught with many technical difficulties because of the low-lying nature of the ground on which the town is built and the fact that much of the ground is reclaimed. The pipes would therefore lie in water, and pumps would be necessary because of the lack of gradient. These factors would much increase the cost of maintenance. At the moment consideration is being given to a plan to install the system (water-carried sewage) in a newly reclaimed area on the outskirts of Belize. Advice is being sought from representatives of the Rockefeller Foundation, World Health Organization, Foreign Operations Administration and other Caribbean towns with similar problems.

Mosquito Control: This programme has continued as reported under "Malaria" and "Yellow Fever".

Enteric Control: There are no developments to report.

Health Education: The impetus given to public health generally by the appointment of Dr. E. Losonczi as Medical Officer of Health has been sustained by the revival of the Central Board of Health. This board first met to advise on the propaganda for the B.C.G. Campaign, and has since continued to function on many important aspects of public health. Meantime the public health nursing staff has been converted to its true function in health education by separating it from all curative functions in connection with infant welfare and pre-natal clinics, thus leaving it free to act solely as health advisers. In schools, the teachers have been given three series of lectures, in which many members of the Health Department participated as lecturers. Two separate campaigns *i.e.* "A Clean Food" and a "Don't Spit" campaign have been run under the jurisdiction of the Central Board of Health and with great support from British Honduras Broadcasting Service.

Lectures on health will be given to Trade Union members during their congress. In this connection, the support of the uniformed branch of the Red Cross whose members have undertaken schools health examinations with remarkable results must be mentioned.

VI. HOSPITAL

The total bed strength of the six hospitals in the colony is 244 or 3.3 per 1,000 population.

There were 5,161 admissions to the six hospitals made up as follows:—

Belize Hospital	2,809
Stann Creek Hospital	760
Punta Gorda Hospital	528
Cayo Hospital	518
Corozal Hospital	331
Orange Walk Hospital	215

Maternity Ward, Belize Hospital: There were 543 deliveries with 4 maternal deaths, as compared with 536 deliveries with 7 deaths in 1953.

List of Surgical Operations performed in Belize Hospital:—

Appendicectomy	95
Intestinal Obstruction	2
Other abdominal Operations	35
Herniorrhaphy	65
Hysterectomy (Total and Sub-Total)	37
Caesarian Section	13
Ectopic Gestation	6
Genito-Urinary Operation	23
Cataracts	—
Other eye, ear, nose, and throat operations	17
Amputations	8
Fractures	148
Minor Operations	675
Tonsils	—
Miscellaneous	37
Total	1,161

Surgical Clinics are held twice weekly and there are two operating days per week.

Out-patient Department: There was a total of 50,843 attendances at the six out-patient departments as follows:—

Belize	32,808
Corozal	4,479
Orange Walk	3,194
Cayo	2,900
Stann Creek	4,523
Toledo	2,939

Tables showing morbidity returns in respect of the hospitals and out-patient departments are shown in Appendices 7 and 8.

Dental Clinics: Three clinics held weekly at the Belize Hospital with a total attendance of 3,186 as against 2,038 in 1953. Visits were paid by a Dental Surgeon to rural districts.

Maternal Hygiene: Clinics were held at seventeen centres throughout the Colony, with a total attendance of 8,156. In Belize the number of cases registered was 496. There were 543 deliveries with 4 maternal deaths; 536 deliveries with 7 deaths in 1953.

Child Hygiene: Clinics were held at eighteen centres throughout the Colony with a total attendance of 44,052. In Belize, clinics were held weekly at two centres, one on the North Side and the other on the South Side of the City. The following statistics shows the volume of work done in Belize.

	Mesopotamia	Victoria Street	Total
No. of Clinics held	47	94	141
No. of New babies registered	559	469	1,028
No. of attendances	4,557	3,947	8,504
No. of Medical Examinations	590	295	885
No. of Health visits to Homes	642	547	1,189
No. of Deaths (0-5 years old)	23	21	44
No. of Deaths under 1 yr. of age	13	15	28
No. of Pounds Powdered Milk distributed (UNICEF)	U.N.I.C.E.F.	2,702¾	2,702¾
No. of Pints Cod Liver Oil distributed	—	10,070	10,070
No. of Pounds Food Yeast	—	—	—

Feeding of School Children: Commitments under this scheme have now been allotted to the Official Charities Fund. They include—

(i) School meals for poor children.
(ii) Provision of mid-morning snack *i.e.* dried skimmed milk, margarine and biscuit for approximately 20% of all school children.
(iii) Provision of dried full cream milk for infant welfare clinics.

A free gift of 100 tons of evaporated milk was received from the United Kingdom in October 1954. This is being distributed (i) to the poor and needy (ii) to domiciled tuberculosis cases (iii) to pre-school children.

~~A total of 15,108 examinations~~ were ~~made,~~ classi~~fied as follows~~:—

MENTAL HOSPITAL

	Male	Female	Total
No. of inmates present at the beginning of the year	44	41	85
No. of inmates admitted during the year	18	12	30
No. of inmates discharged during the year..	10	7	17
No. of inmates died during the year	2	3	5
No. of inmates remaining at the end of the year	51	42	93

Of the number admitted during the year 27 were for observation and of this number 7 were certified as insane.

POOR HOUSE

	Males	Female	Total
No. of inmates present at beginning of the year	26	18	44
No. of inmates admitted during the year	27	5	32
No. of inmates discharged during the year..	9	—	9
No. of inmates died during the year	17	2	19
No. of inmates at the end of the year	27	21	48

LABORATORY

,5,108

A total of ~~13,327~~ examinations were made, classified as follows:—

1. *Haematology—*			
No. of Full Blood Counts	672		
No. of Single Haemoglobin Tests	658		
No. of White Cell Counts with differrential	307		
No. of E. S. R. (Cutler)	564		
No. of Bleeding Time	6		
No. of Coagulation Time	7		
No. of Sickling	—		
No. of Blood Grouping	89		
Total Haemotology		2,303	
2. *Biochemistry—*			
No. of Fractional Test Meals	4		
No. of Blood Sugar	36		
No. of Blood Urea	51		
No. of Spinal Fluids	1		
No. of Renal Function Tests	2		
No . of Vander Bergh	69		
Total Biochemistry		163	
3. *Serology—*			
No. of Kahn Tests	4,004		
No. of Kahn Tests Positive	567		
Percentage of Positives		14.16%	
No. of Widal Tests	171		
No. of Widal Tests Positive	42	24.56%	
Total of Serology			4,175
4. *Blood Parasites—*			
No. of Blood Smears for Malaria			878
No. of Positives	71		
Percentages of Positives		8.08%	
No. containing P. Falciparum	63		
Percentage of P. Falciparum		7.17%	
No. containing P. Vivax	6		
No. containing P. Malaria	2		
5. No of Smears for G. C.			550
No. of positives	159		
Percentage of Positives		28.90%	
Doubtful G.C.	242		
6. Throat Swabs for K.L.B.			18
Throat Positive K.L.B.	3		
7. No. of Stools			477
No. of Positives for Helminthic Ova	105		
Percentage of Positives		22.01%	
No. of Positives for E. Histolytica	47		
Percentage of Positive		9.85%	
8. No. of Sputum for K.B.			1,258
No. of Positives	178		
Percentage of Positives		14.15%	
9. No. of CompleteUrine Analysis	5,286		

APPENDIX I.

DISTRIBUTION OF CASES AND DEATHS FROM COMMUNICABLE DISEASES ACCORDING TO DISTRICTS. 1954.

DISEASES	BELIZE		COROZAL		ORANGE WALK		CAYO		STANN CREEK		TOLEDO		TOTAL	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Tuberculosis of respiratory system (001-008)	73	23	2	1	7	1	10	6	7	2	13	1	112	34
Tuberculosis, other forms (010-019)	23	4	1	—	—	—	—	—	2	—	—	—	26	4
Syphilis and its sequelae (020-029)	172	1	1	—	1	—	3	—	4	1	6	—	187	2
Gonococcal infection (030-035)	902	—	1	—	4	—	11	—	9	—	31	—	958	—
Dysentery, all forms (045-048)	148	2	22	—	30	—	112	3	12	—	41	—	365	5
Other infective diseases commonly arising in intestinal tract (040-044, 049)	68	3	7	—	16	—	12	—	3	—	6	—	112	3
Scarlet Fever	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Diphtheria (055)	3	—	—	—	—	—	1	—	1	—	—	—	5	—
Whooping Cough (056)	520	4	—	1	17	7	84	4	78	5	3	3	702	24
Measles (085)	134	—	9	—	23	—	23	—	52	—	1	1	242	1
Mumps (089)	21	—	—	—	14	—	1	—	—	—	—	—	36	—
Typhus and Other Rickettsial Diseases (100-108)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Malaria (110-117)	250	5	86	—	52	1	227	3	297	—	188	—	1,100	9
Diseases due to Helminths (123-130)	1,692	1	50	—	37	—	285	—	302	2	22	—	2,388	3
All other diseases classified as infective and parasitic (131-138, 036-039, 057-084, 086-088, 090-096, 120-122)	126	6	19	1	7	—	75	5	13	—	15	—	255	12
	4,132	49	198	3	208	9	844	21	780	10	326	5	6,488	97

APPENDIX 2.

AGE AND SEX DISTRIBUTION OF DEATHS FROM ALL CAUSES ACCORDING TO DISTRICTS.

Age Group	Belize District			Corozal District			Orange Walk District			Cayo District			Stann Creek District			Toledo District			Total Colony		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T
Under 1 year of age	66	54	120	19	7	26	11	25	36	19	13	32	14	15	29	36	23	59	165	137	302
1—4 years of age	22	16	38	11	11	22	7	11	18	16	9	25	8	7	15	11	17	28	75	71	146
5—9 „ „ ..	3	6	9	—	3	3	2	—	2	5	3	8	3	—	3	7	3	10	20	15	35
10—14 „ „ ..	2	1	3	1	1	2	1	—	1	—	1	1	—	—	—	2	3	5	6	6	12
15—19 „ „ ..	1	6	7	3	—	3	1	1	2	1	—	1	3	—	3	2	3	5	11	10	21
20—24 „ „ ..	3	4	7	2	—	2	—	1	1	—	—	—	—	1	1	5	1	6	10	7	17
25—29 „ „ ..	7	4	11	1	—	1	1	—	1	—	—	—	—	1	1	1	3	4	10	8	18
30—34 „ „ ..	5	4	9	1	—	1	1	—	1	1	—	1	—	1	1	2	2	4	10	7	17
35—39 „ „ ..	3	5	8	—	—	—	—	2	2	—	1	1	—	1	1	2	3	5	5	12	17
40—44 „ „ ..	3	4	7	—	2	2	—	—	—	2	1	3	2	—	2	2	2	4	9	9	18
45—49 „ „ ..	8	11	19	—	—	—	—	—	—	—	2	2	—	—	—	1	—	1	12	13	25
50—54 „ „ ..	13	8	21	3	2	5	2	1	3	4	—	4	3	1	4	—	—	—	25	12	37
55—59 „ „ ..	9	9	18	1	1	2	—	—	—	1	1	2	3	—	3	1	1	2	15	12	27
60—64 „ „ ..	10	12	22	1	—	1	2	—	2	1	1	2	4	2	6	1	1	2	19	16	35
65 and over „ ..	49	35	84	6	6	12	3	3	6	8	7	15	12	9	21	2	9	11	80	69	149
TOTAL	204	179	383	52	33	85	31	44	75	58	39	97	52	38	90	75	71	146	472	404	876

APPENDIX 3

PULMONARY TUBERCULOSIS

Table showing the Age and Sex Distribution of Deaths.

Age Group	Males	Females	Both Sexes
Under 5 years	6	1	7
6-10	1	1	2
11-20	—	1	1
21-30	3	1	4
31-40	1	2	3
41-50	4	3	7
51-60	6	1	7
Over 60 years	3	—	3
Total	24	10	34

APPENDIX 4.

CAUSES OF DEATHS UNDER ONE YEAR OF AGE.

Cause of Death		Under 1 month	1 Month to under 1 year	Total
Diarrhoea and Enteritis	(571)	—	54	54
Malnutrition	(772)	—	7	7
Congenital Debility	(773)	5	1	6
Congenital Syphilis	(020)	1	2	3
Malaria	(110-117) ..	1	2	3
Pneumonia and Broncho Pneumonia	(763)	3	17	20
Whooping Cough	(056)	—	14	14
Influenza	(480-483) ..	—	—	—
Tetanus	(061)	3	—	3
Dysentery	(045-046) ..	—	1	1
Asphyxia	(762)	4	2	6
Atelectasis of Lungs	(762)	—	—	—
Helminthic Disease	(130)	—	2	2
Umbilical Haemorrhage	(771)	2	—	2
Haemorrhagic Diathesis	(771)	—	—	—
Convulsions	(773)	—	4	4
Congenital Defect	(750-759) ..	1	1	2
Bronchitis	(500-502) ..	—	1	1
Prematurity	(776)	32	1	33
Birth Injury	(760)	3	—	3
Diptheria	(055)	—	—	—
Meningitis	(057)	—	3	3
Congenital Heart Disease	(754)	4	5	9
Rickets	(283)	—	—	—
Pleurisy	(519)	—	—	—
Anaemia	(290-299) ..	1	—	1
Measles	(085)	—	—	—
Enteric Fever	(040-041) ..	—	—	—
Chicken Pox	(087)	—	—	—
Septicaemia	(053)	—	1	1
Mumps	(085)	—	—	—
Erysipelas	(052)	—	—	—
Pemphigos Neonatorum	(766)	—	—	—
Others or Ill-defined	.. ..	61	63	124
Total		121	181	302

APPENDIX 5.

COMPARATIVE TABLE OF BIRTHS AND DEATHS OF INFANTS UNDER 1 YEAR FOR THE PERIOD 1947-1954.

Year	No. of Births	Birth Rate	No. of Deaths under 1 year	Infant Mortality Rate
1947	2,473	40.2	297	120.1
1948	2,506	39.68	264	105.6
1949	2,548	39.90	266	104.8
1950	2,657	39.40	284	106.5
1951	2,905	41.71	275	94.6
1952	3,028	41.38	237	78.3
1953	2,986	39.4	260	87.07
Mean 1947-1953	2,719	40.24	269	99.57
1954	3,231	41.4	302	93.47

APPENDIX 6.

CAUSES OF DEATH IN THE PRE-SCHOOL CHILD.
(1-5 years).

Disease Group		No.	Total in Group
(*a*) *Communicable Diseases*:			
Malaria	(110-117)	1	
Dysentery	(045-046)	—	
Whooping Cough	(056)	8	
Pneumonia and Broncho-pneumonia	(763)	10	
Congenital Syphilis	(020)	—	
Tettanus	(061)	2	
Influenza	(480-483)	—	
Meningitis	(057)	4	
Diptheria	(055)	1	
Helminthiasis	(130)	2	
Enteric Fever	(040-041)	—	
Chicken Pox	(087)	—	28
(*b*) *Diseases of the Nervous System*:			
Convulsions	(773)	5	5
(*c*) *Diseases of the Respiratory System*:			
Bronchitis	(500-502)	1	
Septic Tracheitis		1	
Asthma		—	
Tuberculosis	(001-008)	1	3
(*d*) *Diseases of the Digestive System*:			
Diarrhoea and Enteritis	(571)	28	
Tonsilitis		—	
Gastritis		—	28
(*e*) *Diseases of the Genito-Urinary System*:			
Nephritis		3	3
(*f*) *Injuries, Accidents, etc*:			
Fracture of Skull		—	
Drowning		4	
Poisoning		1	
Burns		1	6
(*g*) *Others*		78	78
		151	151

APPENDIX 7

MORBIDITY REPORT ON OUT-PATIENTS IN ALL THE HOSPITALS OF THE COLONY FOR 1954.

	Name of Disease	Belize	Corozal	Orange Walk	Cayo	Stann Creek	Toledo	TOTAL
C1	Tuberculosis of respiratory system	30	1	2	4	3	7	47
C2	Tuberculosis, other forms	3	1	—	—	1	—	5
C3	Syphillis and its sequelae	166	1	1	1	1	4	174
C4	Gonococcal infection	896	—	3	9	7	29	944
C5	Dysentry, all forms	128	19	29	92	9	26	303
C6	Other infective diseases commonly arising in intestinal tract	54	7	9	—	—	2	72
C7	Certain diseases common among children	—	—	—	—	—	—	—
C7*a*	Scarlet Fever	—	—	—	—	—	—	—
C7*b*	Diphtheria	1	—	—	—	—	—	1
C7*c*	Whooping Cough	506	—	17	79	77	2	681
C7*d*	Measles	127	9	23	22	46	—	227
C7*e*	Mumps	21	—	14	1	—	—	36
C8	Typhus and other rickettsial diseases	—	—	—	—	—	—	—
C9	Malaria	202	63	36	178	200	110	789
C10	Diseases due to helminths	1,668	45	31	279	283	17	2,323
C11	All other diseases classified as infective and parasitic	110	15	3	51	10	2	191
C12	Malignant neoplasms, including neoplasms of lymphatic and haematopoietic tissues	19	—	—	4	—	—	23
C13	Benign neoplasms and neoplasms of unspecified nature	8	—	—	1	—	3	12
C14	Allergic disorders	229	2	1	12	18	4	266
C15	Diseases of thyroid gland	13	3	—	10	—	—	26
C16	Diabetes mellitus	39	1	3	2	—	—	45
C17	Avitaminosis and other deficiency states	175	3	10	19	7	7	221
C18	Anaemias	542	11	2	14	9	97	675
C19	Psychoneuroses and psychoses	171	4	3	5	—	2	185
C20	Vascular lesions affecting central nervous system	5	6	4	1	—	9	25
C21	Diseases of eye	663	149	25	65	101	38	1,041
C22	Diseases of ear and mastoid process	381	38	23	71	97	27	637
C23	Rheumatic fever	26	—	3	5	—	—	34
C24	Chronic rheumatic heart disease	8	1	1	—	2	2	14
C25	Arteriosclerotic and degenerative heart disease	49	5	1	—	4	15	74
C26	Hypertensive disease	194	10	7	3	3	10	227
C27	Diseases of veins	56	—	4	—	3	—	63
C28	Acute nasopharyngitis (common cold)	2,805	236	160	594	214	125	5,134
C29	Acute pharyngitis and tonsillitis, and hypertrophy of tonsils and adenoids	506	15	16	26	57	16	636
C30	Influenza	11	7	—	—	—	6	24
C31	Pneumonia	51	2	3	14	35	5	110
C32	Bronchitis	661	125	86	125	185	98	1,280
C33	Silicosis and occupational pulmonary fibrosis	11	—	—	—	10	—	21
C34	All other respiratory diseases	298	11	7	22	62	30	430
C35	Diseases of stomach and duodenum, except cancer	294	16	9	3	31	31	384
C36	Appendicitis	116	4	8	2	13	5	148
C37	Hernia of abdominal cavity	54	6	3	4	27	5	99
C38	Diarrhoea and enteritis	691	83	111	317	178	24	1,404
C39	Diseases of gallbladder and bile ducts	55	7	8	—	11	4	85
C40	Other diseases of digestive system	738	41	13	104	60	55	1,011
C41	Nephritis and nephrosis	537	105	151	100	1	3	897
C42	Diseases of genital organs	—	—	—	—	—	—	—
C42*a*	Diseases of male genital organs	228	11	11	10	20	7	287
C42*b*	Diseases of female genital organs	1,293	16	15	17	21	26	1,388
C43	Deliveries, complications of pregnancy, childbirth and the puerperium	—	—	—	—	—	—	—
C43*a*	Normal deliveries	—	—	—	—	—	—	—
C43*b*	Complications of pregnancy, childbirth and the puerperium	255	27	14	7	3	25	331
C44	Boil, abscess, cellulitis and other skin infections	1,475	98	39	194	84	57	1,947
C45	Other diseases of skin	1,136	14	18	43	41	26	1,278
C46	Arthritis and rheumatism, except rheumatic fever	666	20	17	39	13	32	787
C47	Diseases of bones and other organs of movement	470	2	4	12	8	3	499
C48	Congenital malformations and diseases peculiar to early infancy	96	5	—	35	—	1	137
C49	Other specified and ill-defined diseases	1,276	13	14	69	135	11	1,518
C50	Accidents, poisonings, and violence (external cause)	—	—	—	—	—	—	—
C50*a*	Occupational accidents and occupational poisonings	482	24	18	5	223	—	752
C50*b*	Accidents and poisonings not specified as occupational	905	43	10	85	162	13	1,218
C50*c*	Other violence	639	29	19	4	68	—	759
	Total	23,239	1,354	1,009	2,759	2,543	1,021	31,925

MORBIDITY REPORT ON IN-PATIENTS IN ALL THE HOSPITALS OF THE COLONY FOR 1954.

	Name of Disease	Belize	Corozal	Orange Walk	Cayo	Stann Creek	Toledo	TOTAL
C1	Tuberculosis of respiratory system	43	1	5	6	4	6	65
C2	Tuberculosis, other forms	20	—	—	—	1	—	21
C3	Syphillis and its sequelae	6	—	—	2	3	2	13
C4	Gonococcal infection	6	1	1	2	2	2	14
C5	Dysentry, all forms	20	3	1	20	3	15	62
C6	Other infective diseases commonly arising in intestinal tract	14	—	7	12	3	4	40
C7	Certain diseases common among children	—	—	—	—	—	—	—
C7*a*	Scarlet Fever	—	—	—	—	—	—	—
C7*b*	Diphtheria	2	—	—	1	1	—	4
C7*c*	Whooping Cough	14	—	—	5	1	1	21
C7*d*	Measles	7	—	—	1	6	1	15
C7*e*	Mumps	—	—	—	—	—	—	—
C8	Typhus and other rickettsial diseases	—	—	—	—	—	—	—
C9	Malaria	48	23	16	49	97	78	311
C10	Diseases due to helminths	24	5	6	6	19	5	65
C11	All other diseases classified as infective and parasitic	16	4	4	24	3	13	64
C12	Malignant neoplasms, including neoplasms of lymphatic and haematopoietic tissues	26	4	—	6	5	—	41
C13	Benign neoplasms and neoplasms of unspecified nature	8	1	—	—	—	1	10
C14	Allergic disorders	14	—	—	—	—	—	14
C15	Diseases of thyroid gland	—	—	—	—	—	—	—
C16	Diabetes mellitus	30	1	—	1	1	1	34
C17	Avitaminosis and other deficiency states	16	—	4	8	1	4	33
C18	Anaemias	22	5	5	8	6	12	58
C19	Psychoneuroses and psychoses	10	5	2	3	—	4	24
C20	Vascular lesions affecting central nervous system	8	1	—	1	—	1	11
C21	Diseases of eye	18	12	—	1	10	10	51
C22	Diseases of ear and mastoid process	16	7	2	1	1	13	40
C23	Rheumatic fever	4	—	1	—	—	—	5
C24	Chronic rheumatic heart disease	4	—	—	—	—	2	6
C25	Arteriosclerotic and degenerative heart disease	36	6	3	3	14	3	65
C26	Hypertensive disease	14	—	—	1	1	2	18
C27	Diseases of veins	12	2	—	—	3	2	19
C28	Acute nasopharyngitis (common cold)	9	1	2	5	16	2	35
C29	Acute pharyngitis and tonsillitis, and hypertrophy of tonsils and adenoids	26	1	4	1	2	7	41
C30	Influenza	6	1	—	3	1	1	12
C31	Pneumonia	68	8	4	15	39	22	156
C32	Bronchitis	88	12	9	13	35	78	235
C33	Silicosis and occupational pulmonary fibrosis	—	—	—	—	—	6	6
C34	All other respiratory diseases	20	3	3	6	16	11	59
C35	Diseases of stomach and duodenum, except cancer	4	7	2	9	17	1	40
C36	Appendicitis	54	4	4	3	4	13	82
C37	Hernia of abdominal cavity	40	1	1	1	2	2	47
C38	Diarrhoea and enteritis	46	6	4	13	26	20	115
C39	Diseases of gallbladder and bile ducts	22	7	2	9	11	4	55
C40	Other diseases of digestive system	22	9	5	7	25	25	93
C41	Nephritis and nephrosis	62	44	32	19	1	10	168
C42	Diseases of genital organs	—	—	—	—	—	—	—
C42*a*	Diseases of male genital organs	120	3	2	8	15	8	156
C42*b*	Diseases of female genital organs	144	4	2	32	14	9	205
C43	Deliveries, complications of pregnancy, childbirth and the puerperium	—	—	—	—	—	—	—
C43*a*	Normal deliveries	616	30	15	27	127	4	819
C43*b*	Complications of pregnancy, childbirth and the puerperium	100	10	5	33	37	17	202
C44	Boil, abscess, cellulitis and other skin infections	86	25	10	28	12	38	199
C45	Other diseases of skin	2	1	4	3	7	3	20
C46	Arthritis and rheumatism, except rheumatic fever	2	7	2	8	6	7	32
C47	Diseases of bones and other organs of movement	—	—	—	2	3	1	6
C48	Congenital malformations and diseases peculiar to early infancy	45	—	—	9	23	7	84
C49	Other specified and ill-defined diseases	259	—	5	11	31	26	332
C50	Accidents, poisonings, and violence (external cause)	—	—	—	—	—	—	—
C50*a*	Occupational accidents and occupational poisonings	10	4	6	18	30	—	68
C50*b*	Accidents and poisonings not specified as occupational	62	15	5	32	37	79	230
C50*c*	Other violence	12	27	18	6	5	—	68
	Total	2,383	311	203	482	727	583	4,689

REPORT ON THE BCG CAMPAIGNS IN BRITISH HONDURAS.

The Origin of the Campaign

The first suggestion for a campaign in British Honduras was made in January 1948 by the then Acting Senior Medical Officer. In March 1951 the Director of Medical Services reopened this question, but only in April 1952 was UNICEF approached for help and advice. In August of the same year Dr. J. L. Bonilla of WHO came to survey the tuberculosis problem of this country and he recommended a BCG vaccination campaign.

In March 1953, UNICEF approved the scheme and provided all equipment and material. The Government of British Honduras agreed to provide all transport and personnel. WHO financed the training of a doctor, a nurse and a laboratory technician and these left for training abroad in May 1953.

The date for the beginning of the Campaign was set for 1st September 1953 and it was decided that the team should visit all communities large enough to have a recognised school.

Planning and Propaganda

Tentative timetables for the Campaign were worked out early in June and Committees were formed in all the districts to advise on propaganda. These Committees were *ad hoc* organizations, comprising members of the Legislative Council, representatives of the schools, churches, voluntary organizations and government officials. The central Committee in Belize first met on the 24th of June 1953 and laid down the general lines of propaganda.

On the 24th of July a meeting of all the medical practitioners in Belize approved the BCG Campaign. On the same day a meeting of all school managers promised the active cooperation of all teachers in the country.

On 2nd August, 1953 the Director of Medical Services opened the propaganda campaign with a broadcast on BCG. His talk was printed in the local papers the following day. Pamphlets explaining the purpose of the BCG vaccination were printed and mailed to all teachers, police constables, nurses and doctors. Extracts from the pamphlets were published daily in the local newspapers and announced over the radio. Posters urging the public to "fight T.B. with BCG" were displayed. The propaganda film supplied by UNICEF was shown to large audiences and lectures were given by doctors, nurses and sanitary inspectors to various groups of the population.

Because of the possibility of jungle yellow fever in monkeys it was decided to offer yellow fever vaccination to the population in the districts during the BCG Campaign.

Material and Equipment

Vaccination kits and forms for statistical records were sent to us from UNICEF headquarters in New York. The "Laboratiorio del BCG" supplied us monthly by air from Mexico City with Purified Protein Derivative of tuberculin in dilution of 5 Tuberculin Units in 0.1 cc in rubber stoppered dark bottles and with BCG vaccine in dilution of 0.025 mg. in 0.1 cc in dark ampoules. Yellow fever vaccine came from the "Instituto Carlos Finlay" in Bogota, Colombia.

Field Work

The first session for tuberculin testing took place on the 11th September 1953. It was held in the hospital compound in Belize. Doctors, nurses and in general all persons employed in the hospital were seen at this session. Policemen, civil servants and their families also attended. On the 14th the results of the tests were read and the first BCG vaccination took place.

Thereafter on Mondays and Tuesdays schoolchildren were tested in the various schools. Wednesdays were reserved for testing the general public usually in a public hall. Thursdays and Fridays the schools were revisited for the reading of the test and vaccination, whilst Saturdays were again reserved for the general public to read the reaction to tuberculin tests given on Wednesdays. In this way all reactions were read on the third day.

Prevaccination testing and vaccinations were made by a team comprising one doctor, four nurses and several voluntary workers. Working with the general public the following routine was evolved:

Two nurses, sitting at a table, were injecting 5 tuberculin unit of P.P.D. intradermally into the dorsal aspect of the left forearm of the people as they came into the room. A third nurse was filling the syringes, the fourth nurse and the doctor were helping the mothers who had brought small children for testing. The records were kept on tally cards supplied by UNICEF. The tallying was done by a voluntary worker, whilst a second voluntary helper made a small indelible mark on the forearm above the test.

At the second visit, all reactions were read by the doctor. Whilst the reaction on the left forearm was read a nurse injected yellow fever vaccine subcutaneously into the right upper arm. The voluntary worker who kept the tally sat next to the doctor.

The negative reactors (showing less than 6 mm in duration) went behind the doctor to a team of two nurses and they received 0.1 cc of BCG intradermally into the left deltoid region. All positive reactors were sent to a table in an opposite direction where voluntary workers recorded names, addresses, age and the size of tuberculin reaction.

In the schools the technique was somewhat different, because individual record cards were used.

Statistical Summary

On our "Monthly Statistical Records" a form supplied by UNICEF, every line represents a separate centre. We have covered the whole country by working at 134 centres of which 30 were in Belize.

We have tested a total of 48,598 people, about 65% of the population. All but 2,495 or about 5% returned for the reading of the test. 23,111 persons received BCG vaccination or about 50% of those whose test was read. In Table I these results are analysed by age groups.

From the monthly returns we obtained some interesting information concerning every community. The proportion of positive reactors in Belize was slightly higher than the average for the country as a whole. In Cayo District the proportion of positive tuberculin reactors was the smallest in the country. The highest percentage of positive reactors was found along the seacoast of Stann Creek District.

The First "Follow Up" Campaign

From 7th February to 2nd April, 1955 with the exception of 14 localities we have revisited all the centres where we have been working in 1953/54. The aim to test and vaccinate all children who since our last visit have completed the first year of life, and to retest and re-vaccinate if necessary the 10 years old school children. In addition to this programme we have retested in 7 schools all the children who have been vaccinated during the original Campaign.

Naturally quite a few people in other age groups took advantage of this Campaign and the statistical summary in Table II is not comparable with the similar summary of the original Campaign. The large number of children who have been vaccinated before increases the proportion of positive reactors.

The table does not reflect the results of the previous campaign either, because of the unknown number of unvaccinated people included in all age groups. This table shows a high proportion of people who did not return for the reading of the test. This is probably due to the fact that the follow up campaign was not accompanied by the same intense propaganda as the first BCG Campaign.

Results of Tuberculin Testing

During the BCG Campaigns we considered all those who reacted to our tuberculin test with an induration of less than 6 mm as negative reactors and we gave them BCG vaccination. The dividing line between positive and negative reactors was arbitrarily drawn at 6 mm and we have attempted from the data accumulated during the Campaigns to study the correctness of this decision.

Size of Reaction in Tubercular Patients

Since the beginning of the BCG Campaigns 18 months ago nobody has been admitted to the tuberculosis hospital among those who have received BCG vaccination. On the other hand 11 of the positive reactors are now in hospital with pulmonary tuberculosis. The mean size of reaction in these cases was 14 mm with a Standard Deviation of 3.2.

At the chest clinic in Belize routine tuberculin testing of apparently healthy contacts is carried out using 0.1 cc solution of 0.0002 mg. of Purified Protein Derivative manufactured by Parke Davis and Co. The injection is given into the volar aspect of the left forearm, intradermally. Among the patients so tested on further examination five were found to be suffering from active pulmonary tuberculosis. The size of reaction in these cases was recorded as 12 mm in two, 15 in two and 18 mm in one patient, giving an average size of 14.4 mm.

Reaction to Different Methods of Testing

In order to investigate the difference between results of tuberculin tests with P.P.D. used at the chest clinic and the P.P.D. used at the mass vaccination campaigns, we gave 15 nurses intradermally 0.1 cc of Parke Davis P.P.D. on the volar aspect of the left forearm and 0.1 cc of P.P.D. supplied by the "Laboratorio del BCG" of Mexico City on the dorsal aspect of the same forearm.

Table III shows as a scatter diagram the correlation between the sizes of tuberculin reaction in this experiment. The coefficient of correlation is—0.89. The mean size of reaction to the tuberculin used in the campaigns is 12.7 mm (S.D.5.8) whilst that of the commercial tuberculin is 10.2 mm (S.D. 4.4). The difference of 2.5 mm has a Standard Error of 1.8.

The size of reaction to tuberculin tests at the chest clinic with the methods used there are therefore not likely to be larger than the sizes measured during the Campaigns and we might say that the average size of tuberculin reaction in patients suffering from tuberculosis is about 14 mm.

Size of Reaction in Hospital Nurses

Beside the 15 nurses who in the above experiment show an average size of reaction of 12.7 mm we have the individual records of 40 nurses in the Belize Hospital who were tested both in September 1953 and in February 1955. The results of these two tests at 17 months interval are shown as a scatter diagram in Table IV.

In September 1953 the size of reaction had a mean value of 9.7 mm (S.D. 3.5). The four negative reactors among these nurses received BCG vaccination. In February 1955 all these nurses were retested on the same forearm. The mean size of reaction has increased by 2.7 mm to 12.4 mm (S.D. 4.2). The coefficient of correlation between the two series is—0.85.

The increase in the size of reaction is due partly to the BCG vaccination of 10% of the nurses taking part in this experiment, partly to the fact that the same site was used as 17 months earlier. Errors in technique and the apparent increase of the size of reaction with age might be equally influential in this difference.

In spite of this we might conclude that in nurses who are exposed to daily contact with tuberculosis patients the average size of reaction in Belize is in the order of 10 to 12 mm.

Size of Reaction in School children

Table V gives the sizes of reaction in a group of 757 school children according to age. The average size of reaction increases with age from 2.3 mm at 4 years to 7.2 mm at 15 years.

In Table VIII we represent in histograms the frequency distribution of the sizes of reaction to intradermal 5 T.U. test before vaccination in three schools in Belize and in the R.C. school in Stann Creek. Table IX gives the same information for Cayo, Orange Walk and Corozal R.C. schools. Table VI is the statistical table on which the histograms are based.

The histograms for Cayo, Orange Walk and Corozal show the bimodal distribution, suggesting that both low grade sensitivity and high grade sensitivity are present and apparently distinct from each other. In the histograms for the schools in Belize and Stann Creek this division is not evident.

The average size of reaction for the 7 schools was 3.9 mm (S.D. 3.8) among the then unvaccinated children.

All the children who were vaccinated about one year earlier and who were still in these schools were retested in February and March 1955. Tables VIII and IX in the lower columns show the frequency with which the various sizes of reaction were found. Table VII gives the same frequency in figures.

Among the BCG vaccinated children the distribution of the size of reaction is almost uniform in all the seven schools. The average size of reaction is now 7.9 mm (S.D. 3.5).

Of course we have vaccinated only those children whose reaction was less than 6 mm. There were 2,531 such children in these seven schools. Of these we found still at school 1,781 or 71% in 1955. The original mean size of reaction in these children was only 1.8 mm. This mean has increased one year after vaccination by 6.1 mm to 7.9 mm.

If we agree that in patients suffering from pulmonary tuberculosis the size of reaction is on the average 14 mm and in nurses exposed to tuberculosis germs the size is on the average

10 to 12 mm, in unvaccinated school children 3.9 mm and in the vaccinated school children 7.9 mm, then we are justified in drawing the line between positive and negative reactors at 6 mm.

This decision is further justified by the fact that the mean increase in the size of tuberculin reaction one year after vaccination—in British Honduras—is 6.1 mm.

Had we drawn the dividing line at 8 mm we would have vaccinated an additional 9.5% of the population, but we would have been obliged to revaccinate at retest an additional 40.6%. If we had selected 4 mm as the dividing line 14.8% would have been excluded from the benefit of BCG, whilst our positive reactors after vaccination would have increased only by 3.3%.

Response to BCG Vaccination

In Tables VIII and IX the lower columns show in histograms the frequency with which various sizes of tuberculin reaction were noted among school children approximately one year after BCG vaccination. The histograms are based upon data supplied in Table VII.

The distribution of the different sizes of reaction in these seven schools show very little variation. The mean size of reaction 7.9 mm (S.D. 3.5) however is very small. This might be due to the strength of the vaccine used.

At retest we found that 86.8% of the children vaccinated had become positive reactors. But we had to revaccinate 13.2% of the children. This might be due to natural loss of BCG induced tuberculin sensitivity with the lapse of time, but it might equally be the consequence of errors in the technique of vaccination.

In Table X we analyse the frequency with which different sizes of scars appear at the site of the BCG vaccination in negative and positive reactors. The mean size of the scar among children showing less than 6 mm induration at retest is 3.1 mm (S.D. 2.22) whilst among the positive reactors it is 4.7 mm (S.D. 2.08). The difference of 1.6 mm is eight times the Standard Error of the difference between these two means.

A study of the histograms in Tables VIII and IX reveals that the frequency distribution of the first three groups (negative reactors) is very similar in each school both in the vaccinated and in the unvaccinated children. This suggests, together with the relatively smaller scar of BCG vaccination, that those who were found to be negative reactors at retest did not benefit from the BCG vaccination, rather than losing their sensitivity with the lapse of time.

Response to Yellow Fever Vaccination

During the BCG Campaign of 1953/54 at the time of reading the tuberculin reaction, we gave yellow fever vaccination to all those who attended, in the districts of British Honduras. In Belize, yellow fever vaccination was offered approximately three months after BCG vaccination.

We were interested to know if simultaneous vaccination with BCG would affect the immunity normally produced by vaccination with yellow fever. Therefore in October 1954 approximately one year after the double vaccination had taken place specimens of blood were collected from school children who had been so vaccinated in Orange Walk, Corozal and Stann Creek. Blood collected from positive tuberculin reactors in the same schools served as control.

These specimens were sent to the Instituto Carlos Finlay in Bogota Colombia and we are indebted to Dr. Augusto Gast-Galvis for the results of mouse protection tests performed with these sera.

Table XI gives the results of mouse protection tests on the sera of children who were positive reactors to tuberculin and therefore received only yellow fever vaccine and on the sera of negative reactors who received both BCG and yellow fever vaccination at the same time.

The difference between the average number of mice surviving, the Average Survival Time of the mice and the proportion of negative sera in the two groups are statistically significant and all are in favour of the group which received yellow fever vaccine alone.

In February and March 1955 we found from the 53 BCG and yellow fever vaccinated children, whose sera was tested, 33 or 64% still in school. The sizes of reaction to 5 T.U. test are plotted against the A.S.T. reported on their sera, as a scatter diagram in Table XII. The coefficient of correlation is 0.30 but it has a Standard Error of 0.17.

The mean size of reaction to 5 T.U. intradermal test 8.7 mm (S.D. 4.4) is comparable to the rest of the means recorded. Also we find no significant difference between post-vaccination tuberculin reactions in Belize, where yellow fever vaccination was not given until about three months after BCG vaccination and the rest of the country, where BCG and yellow fever vaccination was given simultaneously. We can therefore conclude that yellow fever vaccine given sumultaneously with BCG does not influence the development of tuberculin sensitivity.

On the other hand children who received BCG and yellow fever vaccination at the same time show significantly smaller degree of immunity against yellow fever as revealed by the mouse protection test than those who received the yellow fever vaccine alone.

Whilst it is possible that negative reactors to tuberculin as a group are less able to develop antibodies then the positive reactors, it might be possible that BCG given together with yellow fever vaccine hampers the effect of the latter. Further studies would be necessary to elucidate this question.

In both groups of yellow fever vaccinated children as an average their sera protect more than three mice against yellow fever. In 1942 Dr. H. W. Kumm of the Rockefeller Foundation in 209 specimens of blood collected at random from unvaccinated people, found no such protection to exist in British Honduras. The results of yellow fever vaccinations given during the BCG Campaign are therefore not unsatisfactory.

E. LOSONCZI, M.D., D.P.H.,
Medical Officer of Health.

Belize, 2nd April, 1955.

TABLE I.

Statistical Summary of the BCG Campaign in British Honduras 11th September, 1953 to 15th April, 1954.

Age Group	No. tested	No. positives	% positives	No. vaccinated	Neg. not vaccinated	No. not read	% not read
1—6	11,043	814	7.7	9,705	56	468	4.2
7—14	11,484	3,312	28.8	7,723	18	431	3.7
15+	26,071	18,762	71.9	5,683	30	1,596	6.1
Total	48,598	22,888	49.5	23,111	104	2,495	5.1

TABLE II.

Statistical Summary of the first "Follow-Up" Campaign 7th February to 2nd April, 1955.

Age Group	No. tested	No. positives	% positives	No. vaccinated	Neg. not vaccinated	No. not read	% not read
1—6	1,362	134	11.1	1,051	18	159	11.7
7—14	3,530	2,613	81.7	579	3	335	9.4
15+	843	599	88.6	73	4	167	19.3
Total	5,735	3,346	65.9	1,703	25	661	11.5

TABLE III

Correlation between sizes of reaction to tuberculin used during the Campaign and to tuberculin used at the Chest Clinic.

Size of reaction to 0.0002 mg. of Parke Davis & Co. P·P.D. in mm.	Size of reaction to 5 T.U. of P.P.D. used in the campaign in millimeters																									Total
		2		4		6		8		10		12		14		16		18		20		22		24		
2																										
4																										
							1																			1
6						1	1	1	1																	4
8																										
								1								1										2
10												1				1		1								3
										1					1											2
12																										
14																										
16														1												1
18																						1				1
20																									1	1
Total						1	2	2	1	1		1		1	1	2		1				1			1	15

Mean Size of reaction to commercial P.P.D. 10.2 mm S.D. 4.4
Mean Size of reaction to campaign P.P.D. 12.7 mm S.D. 5.8
Coeff. of correlation+0.89

TABLE IV.

Correlation between size of reactions to intradermal 5 T.U. tests given at two periods at 17 months interval.

Size of reaction to second test in millimeters.	Size of reaction to first test in millimeters																								Total
		2		4		6		8		10		12		14		16		18		20		22		24	
2																									
4																									
6		1						1																	2
	1					2	1		1																5
8									1																1
			1				1	1			1														4
10							1	3	1																5
									1																1
12							1					1													2
								1		1					1										3
14										2	1	2													5
						1									1										2
16				1				1					1												3
									1								1								2
18						1								1											2
20																									
22																									
															1										1
24												1												1	2
Total	1	1	1	1		4	4	7	5	3	2	4	1	1	3		1							1	40

Mean size of reaction

to first test	9.7 mm	S.D. 3.5	Date 19.9 1953
to second test	12.4 mm	S.D. 4.2	Date 7.2.1955

Coeff. of correlation+0.85

TABLE V.

Frequency distribution of size of tuberculin reaction according to age among pupils of the Stann Creek R.C. School.

Size of reaction in millimeters	Age in years 3	4	5	6	7	8	9	10	11	12	13	14	15	Total
0—1	4	33	42	33	25	21	25	25	16	17	14	11	12	278
2—3	2	11	19	7	12	15	8	2	5	9	7	3	3	103
4—5	0	5	7	10	12	12	19	6	7	7	9	6	7	107
6—7	0	2	2	3	6	6	5	10	3	14	10	12	18	91
8—9	0	0	3	3	4	2	4	5	4	9	11	10	11	66
10—11	1	1	1	0	2	2	4	5	1	5	5	8	4	39
12—13	0	0	2	0	0	2	1	0	6	3	3	6	6	29
14—15	0	0	1	0	0	2	3	4	5	3	4	1	5	28
16—	0	2	2	0	1	1	1	0	1	3	1	2	2	16
Total	7	54	79	56	62	63	70	57	48	70	64	59	68	757
Mean size of reaction		2.3	2.9	2.3	3.3	3.9	4.3	4.7	5.8	5.9	6.	6.9	7.2	4.6
Standard Deviation		3.4	3.8	3.2	3.6	3.8	4.	4.2	5.2	4.4	3.8	4.3	4.5	3.8

TABLE VI.

Number of children showing various sizes of reaction to intradmal 5 T.U. test in different schools in British Honduras before vaccination.

Size of reaction in mm.	Serial Number of School							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Total
0—1	142	121	163	140	268	247	278	1,359
2—3	94	123	133	111	57	40	103	661
4—5	85	101	73	82	21	42	107	511
6—7	61	74	51	11	9	23	91	320
8—9	43	37	33	5	3	4	66	191
10—11	40	38	18	5	3	9	39	152
12—13	15	19	8	6	5	8	29	90
14—15	6	9	4	7	6	8	28	68
16—17	6	4	26	3	5	1	16	61
18—	9	4		8	5	8		34
Total No.	501	530	509	378	382	390	757	3,447
Mean size of reaction	4.8	4.7	4.2	2.5	2.4	2.7	4.6	3.9
S.D.	4.2	3.8	4.1	3.9	3.6	4.0	3.8	3.8
Positive reactors %	36.0	34.9	27.6	12.9	9.5	15.7	35.8	26.7

TABLE VII.

Number of BCG Vaccinated Children showing various sizes of reaction to 5 T.U. intradermal test in different schools in British Honduras.

Size of reaction in mm.	Serial Number of School							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Total
0—1	19	15	20	8	16	19	24	121
2—3	4	17	10	7	4	2	12	56
4—5	4	13	4	13	7	2	19	62
6—7	66	77	97	120	94	86	183	723
8—9	46	41	33	52	45	39	70	326
10—11	43	35	46	14	33	25	30	226
12—13	28	25	27	8	17	18	18	141
14—15	15	4	9	3	16	14	11	72
16—17	7	3	3	0	2	8	4	27
18—	4	4	1	1	2	8	7	27
Total No.	236	234	250	226	236	221	378	1,781
Mean size of reaction S.D.	8.7	7.7	7.9	7.1	7.9	8.5	7.4	7.9
	3.9	3.6	3.3	2.5	2.3	4.2	3.3	3.5
Positive reactors %	88.6	80.9	86.4	87.7	88.6	89.6	85.4	86.8

No.	Name of School	Vaccination	Retest	Vaccine
1	St. John's Belize	1.10.53	10. 2.55	223
2	St. Mary's Belize	2.10.53	10. 2.55	223
3	St. Ignatius	29.10.53	11. 2.55	226
4	R. C. School Cayo	3.12.53	25. 3.55	228
5	R. C. School Orange Walk	21.1.54	24. 2.55	232
6	R. C. School Corozal	12.2.54	4. 3.55	233
7	R. C. School Stann Creek	1.3.54	18. 3.55	233

TABLE VIII.

Frequency distribution of size of reaction to intradermal 5 T.U. test among unvaccinated and vaccinated schoolchildren in Belize and Stann Creek.

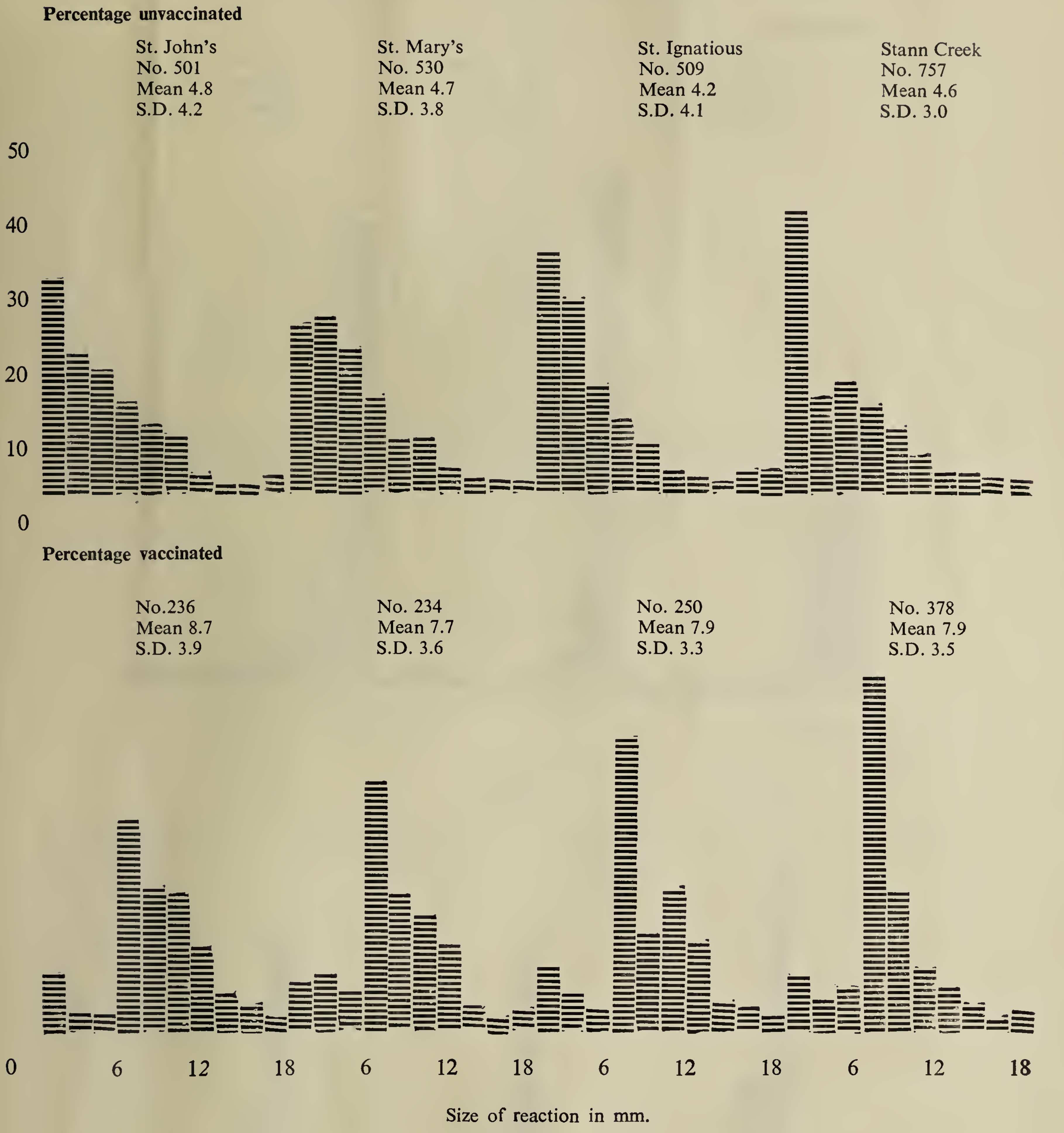

TABLE IX.

Frequency distribution of size of reaction to intradermal 5 T.U. test among unvaccinated and vaccinated children in Cayo, Orange Walk and Corozal schools.

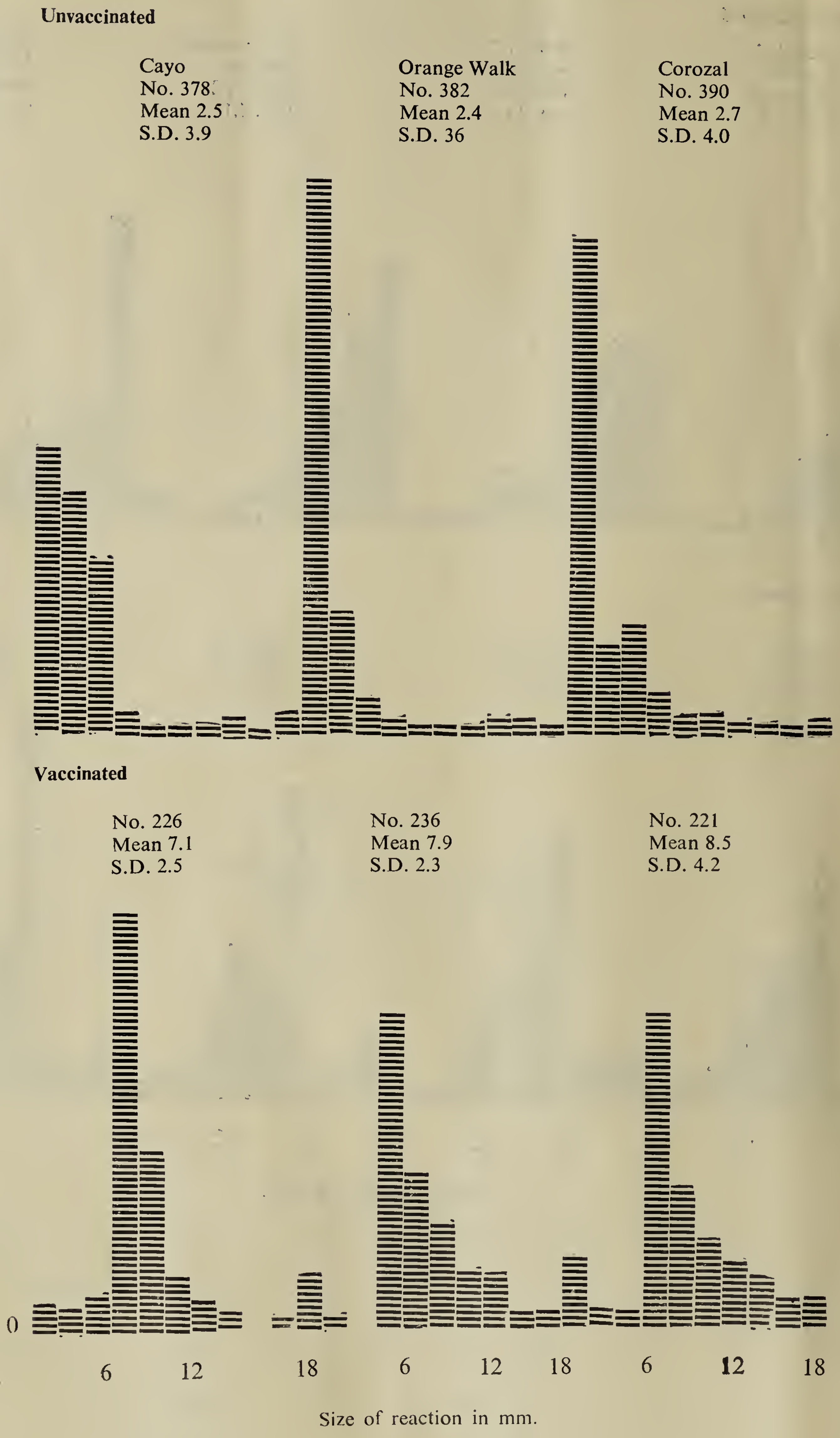

TABLE X.

Different sizes of scars of BCG vaccination measured on positive and negative tuberculin reactors among school children in Belize.

Size of scar in mm	Positive reactors	Negative reactors
0 — 1	42	31
2 — 3	93	29
4 — 5	309	33
6 — 7	124	11
8 — 9	28	0
10 — 11	14	2
12 — 13	2	0
14 — 15	2	0
Total	614	106
Mean size of scar S.D.	4.7 mm 2.08	3.1 mm 2.22

TABLE XI.

Results of "Mouse Protection Tests" with sera collected one year after vaccination from children who received yellow fever vaccine alone and from children who received yellow fever and BCG vaccination.

	Yellow Fever vaccine only	BCG and yellow fever vaccine
Number of children	59	53
Average age in years	12.7	13.3
Average No. of mice alive on the 10th day of experiment (out of 6)	3.72	3.03
Average Survival Time of mice in days A.S.T.	8.71	8.17
Standard Deviation of A.S.T. ..	0.98	1.49
Number of negative sera	7	15
Percentage of negative sera ..	11.8	28.3

TABLE XII.

Correlation between results of tuberculin test and mouse protection test in children who have received both BCG and Yellow Fever Vaccine.

	A.S.T. in mice in days																	Total
	5.5	6		6.5		7		7.5	8		8.5		9	9.5		10		
0					1		1											2
5				1														1
					1		1		1			1	1				2	7
									1	1		1		2			1	6
												1		1		1		3
								1	1									2
10			1						1									2
						1											1	2
										1								1
			1							1					1			3
			1						1						1			3
15							1											1
									1									1
													1					1
													1					1
Total		1			5			10			7				10			33

A.S.T. mean value 8.17 days S.D. 1.49
Mean size of reaction 8.7 mm S.D. 4.4
Coeff. of correlation +0.30